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(71) Applicant *(for all designated States except US)*: SANDVIK AB [SE/SE]; S-811 81 Sandviken (SE).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: BYSTRÖM, Lennart [SE/SE]; Zinkgatan 1, S-811 52 Sandviken (SE). WIMAN, Jörgen [SE/SE]; Kurrasbacken 11, S-811 52 Sandviken (SE).

(74) Agent: ASPEBY, Magnus; Sandvik AB, Patent Dept., S-811 81 Sandviken (SE).

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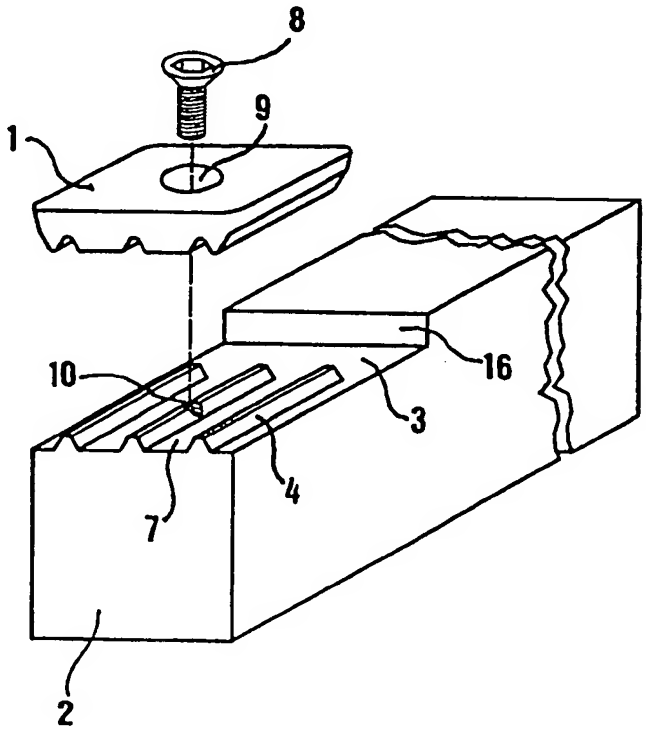
(54) Title: TOOL HOLDER FOR INSERTS, INCLUDING A RIBBED CLAMPING SURFACE

(57) Abstract

A fastening arrangement for cutting inserts on insert holders for cutting machining of metals is arranged in such a way that it comprises parallel grooves (11) on the underside of the insert and ribs (4) on the insert holder (2), the ribs matching into the grooves. The cutting insert is screwed upon the holder, whereby a wedge effect is attained between the grooves and the ribs because the insert's underside does not abut against the plane part surfaces (7) between the ribs, and because the tops of the ribs are not in contact with the bottoms of the grooves.



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TOOL HOLDER FOR INSERTS, INCLUDING A RIBBED CLAMPING SURFACE

The present invention relates to an arrangement for the fastening of cutting inserts on insert holders for the cutting machining of primarily metals.

Different cutting inserts and indexable inserts are fastened on tool holders in several different, known ways. The most common is that the insert has a through central hole and that the insert pocket in the holder has a threaded hole. A locking screw is inserted into the centre hole of the insert and is screwed into the hole of the holder by a suitable torque, a shim with a centre hole often being threaded on the screw and placed between the insert and the bottom support surface. Usually, the cutting insert also comprises two internally substantially perpendicular abutment surfaces, or three abutment points, for abutting against two of the insert's side surfaces. The disadvantage with this construction is that a certain loose easily occurs after a certain time of use. A further drawback is that one may easily tighten the screw too heavily, thereby damaging it or even causing a rupture.

Other known insert holders have a clamp or similar fastening arrangement, that presses upon the upper side of the insert in order to clamp it in the insert pocket. The pressure force of the clamp can be regulated by a screw. Such constructions may for instance be used for fastening cutting inserts without any central hole, which is the case for inter alia cutting-off inserts.

In order to avoid any play and attain a more stable fastening in general of a cutting insert, constructions have been suggested according to which the lower side of the cutting insert and the bottom support surface have been formed as ribbed surfaces intended to match each other. Such a construction is disclosed in US-A-2 140 941 and another in US-A-2 453 464. However, a drawback of these embodiments is that they necessitate a very considerable amount of grinding of the ribbed surface of either the cutting insert or the holder, or both. A further drawback is that, even if the insert has been secured in a direction perpendicular to the ribs, a vertical

play may arise in these constructions just as easily as for two wholly planar abutment surfaces, particularly at machining operations with a tendency to vibrations.

In US-A-4 437 802 it is described how a cutting insert is fastened on a drill, the cutting insert comprising two grooves and the support surface of the drill two corresponding ribs, which are to fit exactly into the grooves and occupy their whole cross-sectional area. Again, the problem is that an axial play may easily arise, particularly if the drill is submitted to vibrations. Moreover, a considerable grinding is required either of the ribs or of the grooves, in order to attain the necessary dimension accuracy.

Thus, a primary object of the present invention is to provide an arrangement for obtaining a stable and play-free fastening of cutting inserts on insert holders, for instance also in the case where the insert has been submitted to vibrations for a long time.

A second object of the present invention is to attain a stable and play-free fixing of cutting inserts on insert holders without any costly and time-consuming grinding.

A third object of the present invention is to avoid the necessity of abutment surfaces or points in the insert pocket, which require a high dimension accuracy.

These and other objects have been achieved by forming the fastening of the cutting insert in the insert holder in accordance with claim 1.

Some preferred embodiments of the invention will now be further described with reference to the appended drawings. These are presented herewith:

Figure 1 shows a holding arrangement according to the present invention in a perspective view obliquely from above.

Figure 2 shows a cross-section of a cutting insert and a holder according to the present invention.

Figure 3 shows an insert holder according to the present invention straight from above.

Figure 4 shows the same cross-section of a cutting insert as in figure 2.

Figure 5 shows the same cross-section of an insert

holder as in figure 2.

Figure 6 shows the bottom side of a cutting insert that has been formed according to the present invention, in a perspective view obliquely from above.

Figure 7 shows the top side of the same cutting insert as in figure 6, in a perspective view obliquely from above.

In the figures a cutting insert is designated by 1 or 1' and a holder by 2 or 2'. The cutting insert is made of a suitable hard material, such as coated or uncoated cemented carbide. Also some ceramics and cubic boron nitride may be used. In first hand, the invention is intended for different turning applications, such as longitudinal turning, copying, grooving and parting-off, but it may advantageously also be used for the fastening of milling cutting inserts.

The upper front part of the holder 2 is provided with a plane holding surface 3. On the holding surface are provided elongated ribs 4, which are internally substantially parallel. According to figure 1, the ribs extend backwardly from the front surface of the holder and substantially parallel with the longitudinal extension of the holder. However, in principle the ribs may present any arbitrary direction, for instance perpendicularly to the one shown in figure 1. At least that part of the ribs 4 which come into engagement with the insert has a basically constant cross-sectional geometry. This geometry has the form of a trapezoid or more precisely, the form of a truncated, equally sided triangle, whose shape is defined by two side surfaces 5 and a top surface 6. The transition between a side surface 5 and the holding surface 3 is either accomplished along a distinct break line or along a fillet with a small radius, which should be located outside the contact area to the cutting insert 1, 1'. The top angle α of the ribs is suitably between 40 and 80°, preferably between 50 and 70° and in particular between 55 and 65°. Between the ribs extend the part surfaces 7 of the holding surface 3, which are substantially plane and have a width that suitably corresponds to between 1 and 4 times the base width of the ribs, preferably between 1½ and 2½. The ribs may extend the whole way to the

rear border line of the holding surface; however, due to production-technical reasons it is suitable that the ribs terminate a distance before this border line, preferably via a short transition part where the height of the ribs gradually decreases and finally disappears.

The cutting insert 1, 1' is fastened by a locking screw 8, which is first introduced through the insert's central hole 9 and is then screwed into the threaded hole 10 in the holder 2. Suitably, the centre line of this hole is situated on the longitudinal centre line of a rib. The bottom side of this insert is formed with substantially parallel grooves 11 intended to accomodate the ribs 4. An essential feature of this invention is that these grooves 11 are directly pressed before the sintering of the cemented carbide or another hard material and thus not ground. They have a sector angle which exactly corresponds to the top angle α of the ribs or that is somewhat smaller than that, however not by more than about 2°, preferably 1°. Of production-technical reasons, the bottoms of the grooves are preferably rounded; of course the rounded part 12 should not intrude upon the side surfaces 13 of the ribs, which surfaces will be in contact with the side surfaces 5 of the ribs. The transition of the grooves to the bottom side 14 of the cutting insert either takes place along a sharp break line or along a small radius. The side surfaces 13 should be completely plane in order to attain a good contact with the side surfaces 5 of the ribs.

As mentioned above, the cutting inserts are directly pressed in their entirety, thus also the grooves 11. Thereby, the surface structure in the grooves will have a certain rugosity, which disappears if ground. The dimensions obtained after sintering and cooling are thereafter taken as set values for the production of the ribs of the holder. A certain grinding of these ribs is not so costly since one single holder may be used for a large amount of cutting inserts.

When fastening the cutting insert, this is placed over the ribs 4 in accordance with figures 1 to 5 and is fastened by the screw 8. At this occasion, it is an essential feature of the present invention that no contact arises between

the bottom side 14 of the cutting insert and the part surfaces 7 of the holder. As may be seen in figure 2, there is thus a gap s between said surfaces 7 and 14. This gap may lie within the size range >0 (e.g. 0,02 mm) and 0,2 mm. Further, it is an essential feature of the present invention that the tops of the ribs do not reach the bottoms of the grooves, which may also be seen in figure 2. By said two essential features, a squeezing wedge effect is made possible between the side surfaces 5 and 13 of the ribs and grooves, respectively, when the locking screw 8 is tightened. This wedge effect results in a fastening of the insert with a hitherto unattained stability and strength. Thus, for most applications abutment surfaces and abutment points become superfluous, as may be seen in figures 1 and 3. This simplifies the production of the insert pocket. Moreover, the slight surface rugosity of the directly pressed grooves positively influence the strength and endurance of the fixation.

Although it does not constitute a preferred embodiment of the present invention, the cutting insert may also be fastened with a suitable clamping arrangement instead of a screw. In this case, the pressure point of the clamp should be situated straightly above the middle groove.

After an operative cutting edge has been worn out, the insert may be loosened and turned 180° around the central axis of the screw 8, in order to indexate a new cutting edge.

As may be seen primarily in figure 1, the threaded hole 10 of the holder is situated on the middle rib. The reason for the hole being located on a rib instead of for instance on a part surface 7 between two ribs, is that the insert may snap if it is submitted to a force between two support lines. In order to confer to the insert a symmetrical fastening force on both sides of the middle groove, the insert and the holder, respectively, are shaped with an uneven number of grooves and ribs, respectively.

A cutting insert that has been formed in agreement with the present invention is well adapted to absorb both axial and radial forces. As an application example, this can be used by making double-functional inserts in accordance with figures

3, 6 and 7. By the straight front cutting edge 14 of this insert, and the curved side cutting edge 15 adjacent to both sides of the former, this insert may be used for transverse turning and also for axial copying, and as a form insert for radial turning. Thereby, a large number of different contours may be obtained.

Although not necessary, for certain applications with very large radial cutting forces, the ribs and grooves according to the invention may be combined with a rear support surface for the cutting insert, such as the surface 16 in figure 1.

CLAIMS

1. An arrangement for the fastening of cutting inserts (1, 1') on insert holders (2, 2') for cutting machining of primarily metals, the bottom surface (14) of the insert being provided with internally substantially parallel grooves (11) and the holding surface (3, 7) of the holder with corresponding, substantially parallel ribs (4), which are intended to fit into said grooves (11), c h a r a c t e r i z e d in that there is a gap (s) between the bottom side (14) of the cutting insert and the holding surface (7) when the cutting inserts are mounted in the holder.

2. Arrangement according to claim 1, c h a r a c t e r i z e d in that the tops (6) of the ribs (4) are not in contact with the bottoms (12) of the grooves (11).

3. Arrangement according to claim 1 or 2, c h a r a c t e r i z e d in that the grooves (11) of the cutting inserts are directly pressed and not ground.

4. Arrangement according to claim 1 to 3, c h a r a c t e r i z e d in that the cross-section of the ribs have the form of a truncated, equally sided triangle.

5. Cutting insert intended to be fastened on an insert holder by the arrangement according to claims 1 to 4, the underside (14) having substantially parallel grooves (11), c h a r a c t e r i z e d in that the relation between the distance between two adjacent grooves (11) perpendicularly to the grooves and the width of a groove on a level with the underside of the insert is between 1:1 and 4:1.

Fig. 2

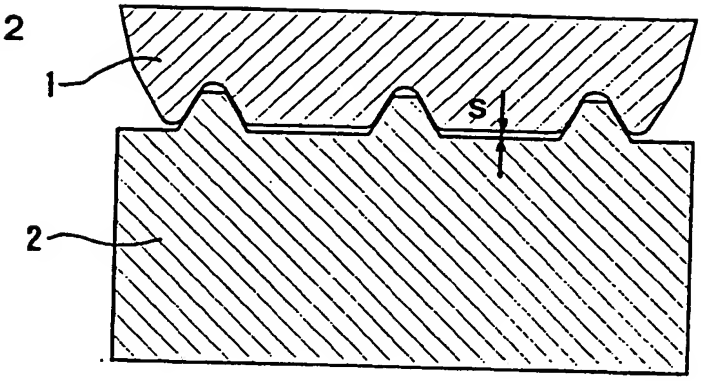


Fig.1

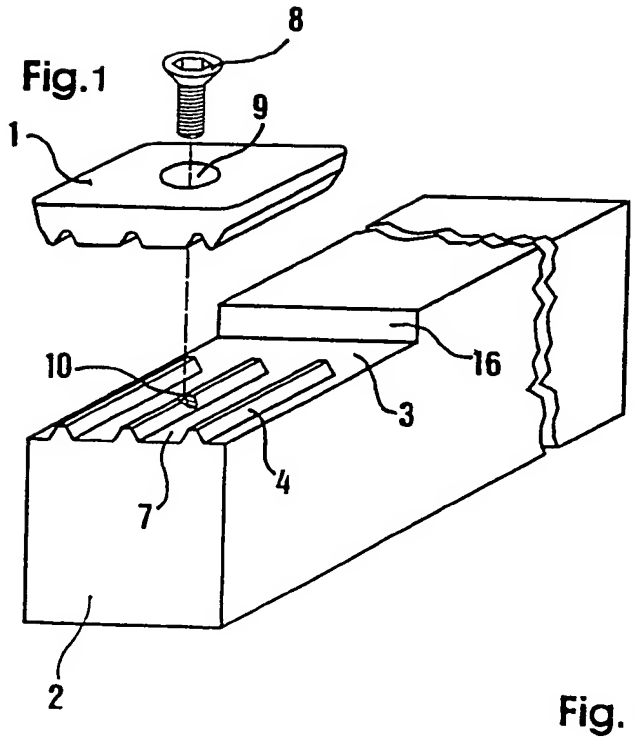
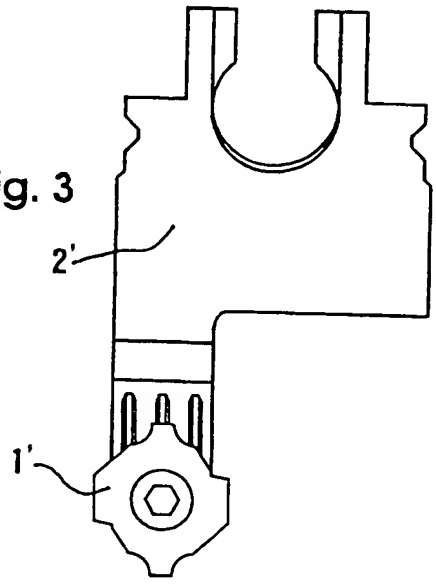


Fig. 3



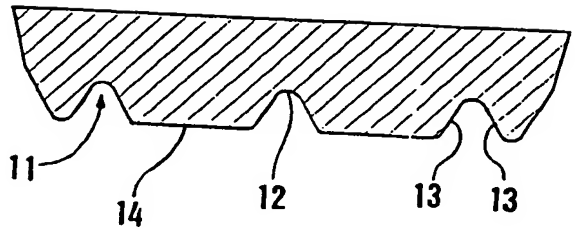


Fig. 4

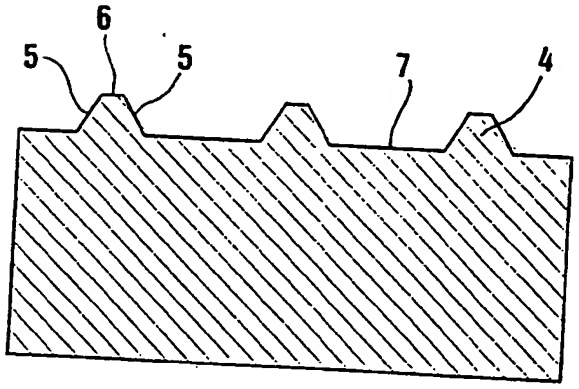


Fig. 5

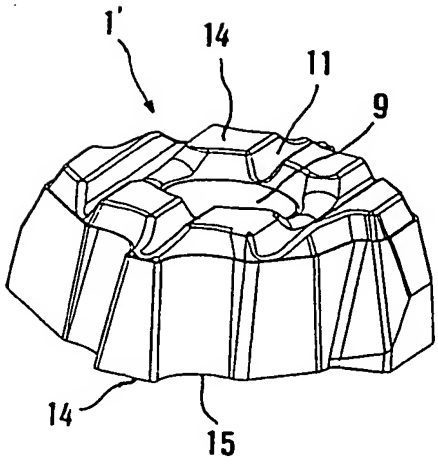


Fig. 6

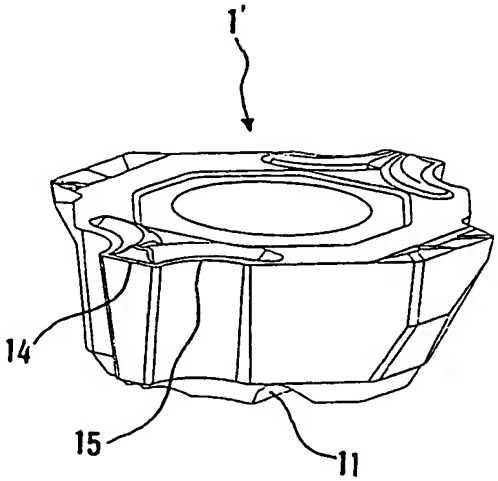


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 95/00414

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B23B 27/16, B23C 5/20
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B23B, B23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO, A1, 8911367 (SIMMONDS ET AL), 30 November 1989 (30.11.89), page 1, line 11 - line 20; page 5, line 30 - line 37; page 7, line 14 - line 16, figure 3, abstract	1-3
A	--	5
A	DE, A1, 3446455 (DIETERLE), 26 June 1986 (26.06.86), figures 7,9,13, claim 1, abstract	4
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A	DE, A1, 3402547 (HARTMETALL-WERKZEUGFABRIK PAUL HORN GMBH), 8 August 1985 (08.08.85), figures 1,2, abstract	4
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Petter Sörsdahl Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE, C2, 2547102 (LINDEMANN), 8 December 1983 (08.12.83), figure 2	5

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INTERNATIONAL SEARCH REPORT

Information on patent family members

03/05/95

International application No.
PCT/SE 95/00414

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO-A1- 8911367	30/11/89	NONE	
DE-A1- 3446455	26/06/86	NONE	
DE-A1- 3402547	08/08/85	DE-C,C- 3448086	19/12/91
DE-C2- 2547102	08/12/83	SE-B,C- 428103	06/06/83
		SE-A- 7513496	22/04/77